Biodiversity Across the Borders

Maintaining biodiversity in the face of environmental change

Conference Program and Abstracts

University of Ballarat

19th June 2009

Centre for Environmental Management

‘Biodiversity Across the Borders’ Conference

Theme for 2009:

Maintaining biodiversity in the face of environmental change

ABSTRACTS

University of Ballarat
Mt Helen, Ballarat
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Edited by: S. K. Florentine, F. P. Graz & G. J. Ambrose

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Program

8:00	REGISTRATION Venue**: 1870 Founders Hall Theatre**
8:45	WELCOME Prof. Kim Dowling **– Head, School of Science and Engineering, University of Ballarat**
8:50	OPENING OF 'BIODIVERSITY ACROSS THE BORDERS' CONFERENCE Prof. Wayne Robinson **– Deputy Vice chancellor, University of Ballarat.**
9:00	KEYNOTE ADDRESS Professor Roger Jones **Biodiversity under climate change: resilient natural systems need adaptive human systems.**
	SESSION 1
	CLIMATE CHANGE AND ENVIRONMENTAL PROCESS Venue: 1870 Founders Hall Theatre Chair: Prof. Andrew Bennett
9:40	Prof. Max Finlayson **Rivers and wetlands in the face of global environmental change: an international overview.**
9:55	Prof. Peter Gell **The sensitivity of wetlands to climate and catchment change: south-eastern Australia.**
10:10	Prof. John Sherwood **Determining the flow needs of estuaries.**
10:25	Assoc. Prof. Geoff Wescott **Ecological processes in Victoria: policy priorities for sustaining biodiversity.**
	MORNING TEA 10:40 – 11:10

	SESSION 2	
	FIRE ECOLOGY Venue: 1870 **Founders Hall Theatre** **Chair: Prof**. Martin Westbrooke	VEGETATION DYNAMICS Venue: Studio **Theatre** **Chair: Prof.** Mike Clarke
11:15	Dr. Alan York **Ecological burning: the response of heathy woodland communities to an altered fire regime.**	Assoc. Prof. Ian Lunt **Maximising conservation outcomes from passive regeneration of woody plants in agricultural regions.**
11:30	Anne Miehs **Do repeated fires negatively impact on fauna associated with coarse woody debris? A case study from south western Victoria.**	Dr. Patrick Graz **Arid zone vegetation dynamics after a rare flooding event.**
11:45	Luke Kelly **Small mammal response to time since fire and habitat structure in semi-arid environments.**	Thomas James Duff **Vegetation pattern and the environment: the potential for modelling alternative states.**
12:00	Seraphina Cutler **Recovery of foothill forest vegetation after fire suppression activities.**	Shona Arber **The ecological role of shrubs in semi-arid grasslands.**
12:15	Dr. Tina Bell **Fire-plant-soil interactions in heathy stringybark Woodlands in Victoria.**	Dr. Maria Gibson **The forgotten flora: battle of the bryophytes.**
	LUNCH SESSION 12:30 – 1:50 UNION BUILDING	

	SESSION 3	
	ENVIRONMENTAL MANAGEMENT Venue: 1870 Founders Hall Theatre Chair: Assoc. Prof. Ian Lunt	FAUNA AND FAUNAL HABITAT Venue: Studio Theatre Chair: Dr. Alan York
2:00	Dr. Rik Thwaites **Understanding rural landholder responses to climate change: a social science approach to land management and biodiversity issues.**	Dr. Julian Di Stefano **What is habitat? The effect of sex, diel period and spatial scale.**
2:15	Penelope Greenslade **Can we prevent loss of specialised montane faunas under climate warming? Monitoring and management.**	Dr. Greg Holland **Widespread but not immune: the bush rat in a highly fragmented landscape.**
2:30	Dr. Grant Palmer **Can't see the forest for the trees! Ecological Thinning in Box-Ironbark.**	Dr. Simon Cook **Reptile assemblages in relation to distance to water in an arid landscape.**
2:45	Andrew Warnock **A new weed emerges from drought – controlling *Lachnagrostis filiformis* (Fairy Grass) on dry lakes.**	Heather Gibbs **Climate gradients and breeding in 16 species of common Australian land birds.**
3:00	Cathy Roberts **Ecology of Red Deer (*Cervus elaphus*) in the Grampians National Park: interactions with native grazers and woodland vegetation.**	Dr. Fiona Christie **Bird assemblages in a heathy woodland: investigating the effects of time since fire on resource availability.**
3:15	Geoff Heard **Pattern, process and the conservation of the endangered Growling Grass Frog in Melbourne's urbanising landscapes.**	Dr. Merilyn Grey **The habitat preferences of an indigenous despot- the Noisy Miner.**
	AFTERNOON TEA 3:30 – 4:00	
	SESSION 4	
4:00	PANEL DISCUSSION: BUILDING RESILIENCE INTO OUR ECOSYSTEM Venue: 1870 Founders Hall Theatre Chair: Prof. Peter Gell	
4:55	Closing address: Prof. Andrew Bennett	

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Biodiversity under climate change: resilient natural systems need adaptive human systems

Roger Jones

Centre for Strategic Economic Studies, Victoria University

Abstract

A number of the firm conclusions that we can make about climate change and biodiversity can influence how we may best respond:

- The response of species and ecosystems cannot be predicted except in the most general sense. Therefore, management should not be based on predicting climate impacts then developing a response. However, scientific prediction using models is not useless; instead their strength lies in diagnostic techniques, especially integration and scenario analysis.
- Ecosystems can adapt to climate change and have done so in the past. The human dominance of many bioregions means that adaptation can no longer proceed naturally. The diverse relationships between people, landscapes and nature need to be better understood for natural and social adaptation to succeed.
- The healthiest ecosystems will be the most resilient (defining resilience as being able to respond to change in good shape). The need to ensure resilience under the total range of threatening processes requires the management of global change processes at the local level. This will require many small plans that fit into a larger systems approach.
- Ecosystem responses to a changing climate include a) shifting along climatic gradients, b) response to and recovery from specific events, c) in situ change and d) system transformation. The latter is least understood and includes healthy outcomes and system collapse.

To respond adequately, the current focus on a stamp-collecting model of conservation needs to refocus on the processes that maintain ecosystem function. Healthy ecosystems will best represent the aspects we value most. Linking ecological processes with natural assets through the medium of global change is a more valid pathway for ecology than static conservation models. A project recently run by Victoria Naturally has identified six threatening processes and seven ecosystem processes that need to be integrated into ecosystem management. Climate processes is only one of these, but can be used as a device for integrating the rest.

Management needs to become reflexive and learn from change in a structured manner. Rather than being predictive, research needs to become two-way: diagnostic approaches explore what is influencing current change, and then become predictive to extend that learning over time. Data bases need to link the biophysical and social spheres – information on human demographics and land-use change is just as necessary as the latest bird census.

Since 1997, climate in south-eastern Australia has changed significantly. A step-change in rainfall of up to -15% and in maximum daily temperature of almost 1°C in summer is causing serious stress in some systems. A number of the identified threatening processes have accelerated in their impact and we can see clear links between them. Some risks, such as climate combining with land-use pressures to increase fire risk, have increased non-linearly. The institutional frameworks that currently deal with the environment, but also planning, infrastructure and primary production will have to become much more adaptable if a learning-by-doing approach is to be implemented. To determine how to best foster resilience in ecosystems, our institutional frameworks managing those ecosystems with themselves have to become much more adaptable than they are now.

Questions/Notes:

Rivers and wetlands in the face of global environmental change: an international overview

Max Finlayson

Institute for Land, Water and Society, Charles Sturt University, Albury, NSW

Abstract

The importance of rivers and wetlands for human wellbeing has been increasingly recognised in recent years, partly in response to the growing realisation that these ecosystems were being degraded or lost at an alarming rate. The loss of wetland species has been shown by various indicators and exceeds that from forests and grassland ecosystems. Many large rivers are now highly modified and agricultural expansion and intensification have globally wreaked havoc on wetland ecosystems and their species. In many instances there have been great benefits to people through, for example, the provision of food, fuel and freshwater, but the continuing loss or degradation of rivers and wetlands has also resulted in the decline of the regulatory services that these ecosystems provided. As the causes and costs of such decline become more and more evident we are facing further environmental change through global climate change (including sea level rise) with both direct effects and exacerbation of existing pressures on rivers and wetlands and their biodiversity. In facing this scenario we may need to make major decisions about the future of our rivers and wetlands – not only what biodiversity we want to retain, but also the ecosystem services that are provided and even who benefits from the inevitable trade-offs that will occur. Under such a scenario do we need to look forward and rid ourselves of the notion that we can simply refer to the past as a basis for establishing reference conditions for ecosystem management? If we do this, how do we make decisions about the future? Do we have the means to do better than we have done before – the knowledge, technology or integrity?

Questions/Notes:

The Sensitivity of Wetlands to Climate and Catchment Change: South Eastern Australia

Peter Gell

Centre for Environmental Management, School of Science & Engineering, University of Ballarat, Victoria.

Abstract

The crater lakes of western Victoria are known internationally for records of climate change archived in their sediment records. Many biological and geochemical indicators have revealed considerable change to the water balance of these sites, and this has driven large changes in lake depth and salinity. These changes are evident in the long records of wetlands elsewhere. Along the River Murray some wetlands have shown changes in condition over thousand year time frames. Some other lakes record evidence of past dry spells by becoming shallow and more saline. Alternatively, many wetlands, and estuaries in particular, have been shown to be particularly resistant to climate-driven changes. By contrast all wetlands examined across south-eastern Australia are in a condition that is outside their range of historic variability. Several were impacted soon after settlement, succumbing to increased fluxes of sediments and salts. The magnitude of change increased during the 20th century, with many wetlands becoming turbid and saline. Several closely linked to the main River Murray channel have shown state switches from clear water to turbid, and even those considered in good ecological condition have departed considerably from their pre-European baseline. Now, with an extreme drought event, overlying an extended period of drying, many wetlands have dried and some, along the River Murray, have become acidic. Response models to future climate change suggest that the management of these systems needs to recognise a considerable and ongoing freshwater deficit leading to increased ephemerality. Managers of coastal wetlands need to consider sea-level rise and begin to imagine more actively tidal systems.

Questions/Notes:

A Victorian approach to determining environmental flow needs of estuaries

Sherwood, John[1], Adam Pope[1], Lance Lloyd[2], Chris Gippel[2], Marcus Cooling[2], Jeremy Hindell[2] and Brett Anderson[2]

[1]Deakin University, Warrnambool campus, Victoria.

[2]c/o Lloyd Environmental, PO Box 3014, Syndal, Victoria.

Abstract

Environmental flow requirements of rivers have been the subject of much research. In Victoria a standard methodology (the FLOWS Method) has been developed to establish the water needs of the freshwater reaches of rivers. Until recently it was assumed that these flows would also meet the needs of estuaries. A growing body of research has questioned this assumption. In 2005 the Victorian State Government funded a project to develop an estuaries methodology. It is currently being trialled on the Werribee and Gellibrand estuaries. This presentation will discuss the nature of estuary water needs and outline the approach being trialled.

Questions/Notes:

Ecological processes in Victoria: policy priorities for sustaining biodiversity

Geoff Wescott

Deakin University, Melbourne Campus, Victoria.

Abstract

The Victoria Naturally alliance commissioned a two stage process to address the needs of biodiversity conservation in Victoria. In the first stage, led by Prof. Andrew Bennett, the group reported that the essence of biodiversity protection lay in protecting the various ecological processes that underlie the functioning of natural ecosystems.

In the second stage, led by the author, a second group was asked to investigate the policy options available to implement the protection of ecological processes in Victoria.

This project used a 14 person expert advisory group, a series of 24 structured interviews of experts, a full day workshop (attended by 60 people) and a literature review to ascertain the best approaches available globally.

The first finding was that there was no 'silver bullet' – no magic answer deduced anywhere in the world for how to implement a policy protection regime for ecological processes. Nevertheless some key findings and recommendations did emerge and this paper will report on these findings.

The final report (titled "Ecological Processes in Victoria: Policy priorities for sustaining biodiversity" by Ann McGregor, Brian Coffey, Carrie Deutsch, Jim Robinson and myself) is available on line at www.victorianaturally.org.au under 'publications'

Questions/Notes:

Ecological burning: the response of heathy woodland communities to an altered fire regime

Alan York

Department of Forest and Ecosystem Science, University of Melbourne, Creswick, Victoria.

Abstract

Temperate eucalypt woodlands are amongst the most poorly conserved and threatened ecosystems in Australia, surviving primarily as remnant patches of varying size, quality and isolation. Fire has been a recurring event in the evolutionary history of these woodlands, with inappropriate fire regimes currently recognised as a threat to their continuing persistence. Across Victoria, ecological burning strategies are primarily based on a limited number of plants or animals, generally those that are threatened or endangered, or with known fire responses. One such species is the south-eastern sub-species of the Red-tailed Black Cockatoo, which lives in and around Heathy Stringybark woodlands near Casterton in south-western Victoria. Burning strategies currently use 'cool' strip burns to limit canopy scorch and damage to the food source of the Cockatoo, while protecting surrounding large areas of unburnt woodland. What we don't know is the impact of this particular strategy on other plant and animal species, some of which may be fire-dependent, and what this means for conservation of regional biodiversity. Current research aims to investigate the habitat requirements of these species to determine the burning regime that might best suit the diversity of the area. Results are discussed in light of the current Management Plan for the area, which, for ecological purposes, excludes and limits the amount of prescribed fire.

Questions/Notes:

Do repeated fires negatively impact on fauna associated with coarse woody debris? Maintaining biodiversity in south-western Victoria.

Anne Miehs[1], Alan York[1], Tina Bell [1] and Kevin Tolhurst[1]

[1] Department of Forest and Ecosystem Science, University of Melbourne, Creswick, Victoria.

Abstract

There is growing interest in fire management in Australia due to the prediction of increased fire frequency and extent as a result of the onset of climate change. Current burn plans are predominantly based on plant vital attributes (life history traits and how they respond to fire). The importance of incorporating the needs of fauna into fire plans has only recently been recognised. To date we know little about the habitat requirements of vertebrate fauna or how fire impacts on these features. Coarse woody debris (CWD) has been identified as a potentially important habitat type for an array of fauna and also plays a vital role in fire behaviour and fire suppression because it is a heavy fuel. This research examines the impact of repeated fires on the diversity and abundance of selected vertebrate (reptiles, frogs and small mammals) species associated with CWD in the fire prone, Stringybark woodlands of south-west Victoria. Pitfall and Elliot trapping were conducted seasonally to sample fauna in areas of differing fire frequencies and densities of CWD. In total there were 3965 captures from 22 species. Preliminary data analysis suggests that repeated fires do not appear to negatively impact on the individual abundance or species diversity of vertebrates in the Stringybark woodlands of Casterton. In addition, the fauna under study were not strongly associated with CWD in this system. A range of other habitat elements were measured as part of this research, e.g. grass trees and leaf litter depth, and these may be influencing the distribution and abundance of small vertebrates in this landscape. Our study will provide an important contribution to local land managers to assist with production of future fire plans and will considerably improve our understanding of habitat requirements of small vertebrate fauna and the potential impacts of fire on habitat components.

Questions/Notes:

Small mammal response to time since fire and habitat structure in semi-arid environments

Luke Kelly[1], Dale Nimmo[1], Simon Watson[1], Lisa Spence-Bailey[2], Michael Clarke[2] and Andrew Bennett[1]

[1] Landscape Ecology Research Group, Deakin University, Melbourne, Victoria, [2] Department of Zoology, La Trobe University, Bundoora, Victoria.

Abstract

Fire is a major process that shapes the composition and structure of Australian ecosystems. It is also an important tool available to manage faunal communities. While the influence of fire on patterns of small mammal occurrence has been well-studied in some ecosystems, there is little knowledge of small mammal response from semi-arid environments. In this presentation, we provide an overview of our research on small mammal distribution in semi-arid Australia. In particular, we focus on the role of fire and habitat structure in determining species distribution. This study was undertaken in eucalypt-dominated vegetation in the Murray Mallee region of southern Australia. A total of 280 sites, representing a chronosequence of 0 - 100 years post-fire, were surveyed for small mammals. A combined total of 70,000 pitfall and Elliot trap-nights resulted in 1,261 captures of seven species of small mammal. Commonly encountered species included the Mallee Ningaui, Western Pygmy Possum, Common Dunnart and introduced House Mouse. Time since fire has a significant influence on several species. For example, the Mallee Ningaui typically is absent from early post-fire vegetation (0-10 years) and more likely to occur in later post-fire age-classes. Habitat modelling indicates that changes in vegetation structure over time, particularly spinifex cover, are the most likely causal influence on the delayed post-fire recovery of Mallee Ningaui. Understanding the ecological processes that determine species' distributions provides a stronger basis for ecological fire management and is essential if we are to maintain biodiversity in changing landscapes.

Questions/Notes:

Recovery of hillslopes following bushfire suppression activities in forest systems

Seraphina Cutler and John Morgan

Department of Botany, La Trobe University, Bundoora, Victoria.

Abstract

Monitoring of bushfire and bushfire suppression operation impacts is a specified component of the bushfire recovery process of many land management agencies. However, to date, there have been few formalised monitoring programs established to investigate the impacts of fire suppression activities. This research investigates the recovery of hill-slopes following the machine grading of fire breaks as part of bushfire suppression operations. Construction of mineral-earth fire breaks is a widely utilised technique in bushfire suppression operations, with thousands of kilometres of new fire breaks constructed in Victoria, primarily by bulldozing, during the past decade alone. Fire-breaks represent extensive but narrow areas of soil disturbance, creating a high risk of soil erosion, potential for the establishment and spread of exotic plants and disruption of native habitat. Consequently, following a fire event, many fire-breaks are rehabilitated as part of the bushfire recovery process. In this study we ask: do rehabilitated fire-breaks differ in their floristic composition or functional status relative to reference areas (both burnt and unburnt), and/or under different rehabilitation treatments, and do these sites recover over time? Recovery was assessed in terms of species composition, ground cover conditions and landscape function (using Landscape Function Analysis) at sites in the foothill forests of NE Victoria. Surveys were carried out 7, 14, and 48 months post disturbance/rehabilitation at a range of sites under different management treatments including: (1) bulldozed fire-containment lines rehabilitated with cross drains; (2) bulldozed fire-containment lines rehabilitated with topsoil replacement, cross drains and contour logs; (3) burning; (4) intact reference sites. Results showed species richness was relatively high following disturbance, even on fire-breaks with the most basic rehabilitation. However, there was an increase in the number of exotic species along fire-breaks relative to reference sites (both burnt and unburnt), with exotic species persisting through time. As might be expected, functional state, in terms of the Landscape Function Analysis indices of stability, infiltration and nutrient cycling, was reduced following bulldozing. Furthermore, functional state was generally enhanced with the addition of more comprehensive rehabilitation measures. However, while functional status of rehabilitated fire breaks showed improvement with time, after 48 months the functional state of intact reference sites had generally not been attained. These findings suggest that with the current rehabilitation measures, recovery of these systems is likely to be slow following fire-break construction.

Questions/Notes:

Fire-Plant-Soil interactions in Heathy Stringybark woodlands in Victoria

Tina Bell

Department of Forest and Ecosystem Science, University of Melbourne, Creswick, Victoria.

Abstract

Low nutrient soils are a defining feature of fire-prone woodland ecosystems throughout Australia and Heathy Stringybark woodlands in western Victoria are no exception. Interactions among fire and plants growing in these soils were investigated with a series of field and laboratory-based experiments. Firstly, to determine the 'recovery' of soil after fire, soils (0-5 cm) were sampled from sites within four time-since-last-fire categories: very recently burnt (1-3 years), recently burnt (4-10 years), medium unburnt (11-25 years) and long unburnt (>25 years). Nitrate, extractable P, total N and total C did not vary with time-since-last-fire but ammonium was up to four times greater in soil from recently and very recently burnt sites compared to soil from long unburnt sites. Secondly, loss of N from soil after completed combustion at 800 ˚C was small in comparison to losses from above-ground fuel. Both of these pieces of evidence suggest that occasional wildfires do not greatly perturb soils of Heathy Stringybark woodland mainly due to the inherently low nutrient capital. Thirdly, to investigate vegetation response to nutrient availability, several legume species commonly found in Heathy Stringybark woodland were grown in soil either collected from long unburnt sites (field soil) or white sand (negligible nutrient content) and with or without a soil P supplement. All species produced significantly greater biomass and nodulation was higher when grown in field soil amended with P, but N in leaves from all treatments was not markedly greater. This is just one example of the variety of responses that plants from Heathy Stringybark woodlands display according to nutrient availability and disturbance.

Questions/Notes:

Maximising conservation outcomes from passive regeneration of woody plants in agricultural regions

Ian Lunt[1], Catherine Allan[1], John Morgan[2] and Peter Spooner[1]

[1]Institute for Land, Water & Society, Charles Sturt University, NSW, [2] School of Botany, LaTrobe University, Victoria.

Abstract

In many regions of SE Australia native trees and shrubs have regenerated over large areas over the past 30 years. This passive (unassisted) regeneration is often triggered by land-use changes (e.g. reduced grazing and rural lifestyle landuse) and appears to be most widespread in non-cropping regions in central Victoria and coastal areas. Compared to intentional plantings, passive regeneration has been poorly studied by researchers, and has received relatively little attention from land management agencies. It is often not explicitly mapped, and its value for biodiversity and other ecosystem services is poorly documented. Social perceptions of regeneration vary widely from 'precious regeneration' to 'woody weeds'. Climate change provides a strong incentive to enhance our understanding of 'altered ecosystems', as global warming will fundamentally alter many natural systems in Australia. In this talk we highlight major information gaps about altered ecosystems that result from passive regeneration by native trees and shrubs. Further information is required on: (1) the processes that promote passive regeneration, (2) its contribution to biodiversity conservation and other ecosystem services, (3) social perceptions of these ecosystems, (4) ongoing successional changes (do they 'stagnate' or improve?), and (5) practical methods to enhance their conservation value. Passive regeneration often occupies much larger areas than intentional conservation plantings, and provides a valuable resource to achieve many regional NRM goals. However, to maximise outcomes, greater recognition of the ecosystem services provided by passive regeneration is required. In many cases, the emphasis may have to shift from viewing these areas as 'degraded' forms of 'natural' ecosystems to being seen as 'improved' forms of previously degraded land.

Questions/Notes:

Convergence of arid zone vegetation composition after a rare flooding event

F. Patrick Graz[1], Singarayer Florentine[1], Per Milberg[2], and Martin Westbrooke[1]

[1] Centre for Environmental Management, School of Science. & Engineering, University of Ballarat, Victoria

[2] Department of Biology, Linkoping University, Sweden

Abstract

Disturbances such as fire or flooding play an important role in moulding arid zone vegetation. In the past, studies have focused on the effects of grazing and fire. Little attention has been given to the effects of flooding and its interaction with both grazing and fire. In part, this is due to the low frequency of such events.

Additional knowledge is needed on the response of arid zone vegetation to those extreme events,, mainly to order to facilitate management under the altered disturbance regimes predicted in association with changes in climate.

In this project, we present the results of ten years of monitoring of a rare flooding event that occurred in 1997 in Olary Creek of South Australia and New South Wales. The event provided the opportunity to study the impact of such events on the structure, function, patterns of species colonization, and succession of arid ecosystems.

Part of the flooded area had burnt in December 1996, resulting in an interaction between flooding and burning. Plots of 25x25m^2 were established in pairs - with one plot from each pair protected to exclude grazing, to monitor the development of the botanical composition.

Results show that there are differences in the effects of flooding, burning and grazing on the development of vegetation composition. Analysis of the average Chi-square dissimilarities between the individual plots showed a significant overall decline with time, however, implying a convergence in the composition of the vegetation.

Questions/Notes:

Vegetation pattern and the environment; the potential for modelling alternative states

Thomas Duff, Tina Bell, and Alan York

Department of Forest and Ecosystem Science, The University of Melbourne, Creswick, Victoria.

Abstract

Defining the factors influencing vegetation condition in natural systems is challenging due to the range of potential influences and interactions at various scales. Where there are large numbers of variables, the availability of suitable field measurements can become limiting due to poor model power. The modelling of group or community properties can assist in simplifying large datasets and can lead to increase predictive power and more robust inferences. This talk presents preliminary results from a landscape-scale study investigating drivers of vegetation change in heathy woodlands in South Eastern Australia. The woodlands are a Mediterranean type environment, exhibiting summer drought, wildfire, low soil nutrients and high floristic diversity. Management of these areas involves landscape-scale manipulation of fire to achieve a range of goals, including ecological and socioeconomic, even while vegetation dynamics are not fully understood. Modelling community response to environmental influence has the potential to maximise the utility of scarce information, help target information collection and assist in optimising management activities. The results presented here are initial outcomes from a project investigating vegetation composition at both site and landscape levels. Key aims are to assess the environmental drivers of abundance for plant species and compare various methods of modelling species and community pattern at a landscape scale.

Questions/Notes:

The ecological role of shrubs in semi-arid grasslands

Shona Arber

Terrestrial Ecology Group. Department of Botany, La Trobe University, Bundoora, Victoria

Abstract

Shrubs create spatial heterogeneity in herbaceous communities by affecting light availability, litter, soil nutrients and water. Consequently, the presence of shrubs can influence the distribution and composition of local species assemblages. I examined resource availability and plant species distributions under and at the edge of the canopy of two native shrub species, *Nitraria billardierei* and *Maireana aphylla*, and in intershrub spaces of native tussock grassland from the semi-arid region of northern Victoria. Resource contrasts between shrub and open-patches were evident. When compared with inter-shrub spaces, shrub-patches could be defined as having increased soil moisture and litter, varied soil nutrient properties and reduced light availability. A total of 25 species was observed in the standing plant community, of which fifteen showed preference for either shrub (5) or shrub-edge/open-patches (10). This would suggest that shrub-induced heterogeneity was essential for the growth of 60% (15/25) of observed species. Moreover, it appears that the demographic response of particular life-forms (i.e. perennial vs. annual habit) is influenced by the patchiness created by shrubs. Microhabitat differentiation under shrub canopies and the contrast in above-ground flora between shrub patches and inter-shrub spaces suggests that shrubs play a key role in shaping community assembly in semi-arid grassland of northern Victoria via a complex combination of positive and negative effects. By modifying the local environment, shrubs affect niche availability and, consequently, species distributions. Taken together, the results support a niche-based view of shrub-grassland dynamics in which subtle but pervasive habitat specialization and strategy differentiation contribute to species coexistence. Further research is required to investigate the mechanisms generating the observed differences in resource and species distribution, with particular attention to the life-stage of focal shrubs and explicit consideration of species life-history i.e. relative stress tolerance vs. competitive ability.

Questions/Notes:

The forgotten flora: battle of the bryophytes

Maria Gibson

Life and Environmental Sciences, Deakin University, Victoria

Abstract

The bryophytes have a tough battle on several fronts: much of society has no idea what a bryophyte is or why bryophytes are important; there are comparatively few ecological studies investigating bryophytes; environmental change is causing reduction in species richness and diversity. This talk will discuss the ecosystem functions of bryophytes and explore some of the evidence relating to their fight for survival.

The importance of bryophytes to soil stabilisation, invertebrate and bird biodiversity, hydrology, nutrient dynamics and pollution monitoring will be explained. The effects of habitat simplification, urbanisation, logging and reduced rainfall will be examined and implications for management to halt or minimise loss of biodiversity will be considered.

Questions/Notes:

Understanding rural landholder responses to climate change: a social science approach to land management and biodiversity issues

Rik Thwaites, Allan Curtis, Nicky Mazur, and Digby Race

Institute for Land Water and Society, Charles Sturt University

Abstract

It is widely accepted that climate change is a reality and that individuals, sectors and societies will have to adapt to climate change. Over generations, Australian rural landholders have learned to manage their properties under a highly variable climate, including extended periods of 'drought'. In south eastern Australia, below-average rainfall has been experienced for over a decade, placing stress on rural enterprises and on ecosystems. Drawing on literature from the broad fields of climate change, risk perception and adoption of innovation by landholders, the authors developed a model to explain landholder responses to climate change. This model provided a useful framework to explore landholder beliefs and responses to climate change in a subsequent study in two contrasting rural districts in the state of Victoria. The model also assisted in the development of semi-structured interview questions and in qualitative data analysis and interpretation.

The research confirmed expectations that changing climate is forcing landholders to make decisions, but that land management decisions are complex. Our case study suggests that climate is an important factor, but not necessarily the most important factor influencing land management decisions. Landholders are responding to climate in a variety of ways, including by capturing and making more efficient use of water, changing their land use and enterprise mix and diversifying income streams. However, landholder responses varied considerably and sometimes in opposite directions. For example, some landholders have responded to climate stress by expanding, intensifying and modifying their operations to increase output and enhance efficiency. Others have sought to manage climate risks by reducing debt and seeking low input/management systems. These differences were often context specific in that they reflected differences in the two case study districts (farming systems, agronomic potential) as well as characteristics of individual landholders. The paper reflects on the implications of these findings for native vegetation on private land.

Questions/Notes:

Can we prevent loss of specialised montane faunas under climate warming? Monitoring and management.

Penelope Greenslade

Environmental Management, School of Science and Engineering, University of Ballarat, Victoria

Abstract

Global warming has the potential to considerably alter the distributions of biological communities. Consequently it is desirable to document now, if practicable, the effect of gradually changing climates on vulnerable faunal assemblages, providing suitable sites can be found. Any results should allow an understanding of the resilience of these ecosystems and their faunal assemblages in their ability to adapt to change. Examples of gradually changing climates that are convenient to sample are the climatic gradients that occur over quite short distances along altitudinal transects. It is predicted that faunas at low altitudes will adapt to warmer and drier climates by moving to a higher altitudes but faunal assemblages at the highest altitudes might be expected to be eliminated.

In Australia, there are two long term monitoring sites along altitudinal transects, located at widely different latitudes, that are being sampled with the aim of detecting vulnerable species at the highest altitudes. These species could act as such “climate predictors” or sentinels of change. One of these transects is in Tasmania in the Warra forestry reserves and the other in south-eastern Queensland in the Lamington National Park.

Results for Collembola will be reported. The data provide a baseline from which to monitor changing species distributions with temperature decrease and rainfall increase along the transects. A number of species were detected on each transect with limited ranges with regard to altitude. Information on these indicator taxa will later be fed into management decisions in both subtropical and temperate regions. These climate predictors will act as key components of monitoring systems to build adaptive capacity into environmental, social and economic planning.

Questions/Notes:

Can't see the forest for the trees! ecological thinning in Box-Ironbark forests

Grant Palmer[1], Geoff Brown[2], Matt Gibson[1], Patrick Pigott[1], Arn Tolsma[2] and Alan Yen[3].

1 Centre for Environmental Management, University of Ballarat, Mt Helen, Victoria.

2 Arthur Rylah Institute for Environmental Research, Dept. of Sustainability & Environment, Brown St, Heidelberg, Victoria.

3 Biosciences Research Division, Department of Primary Industries, 621 Burwood Hwy, Knoxfield, Victoria.

Abstract

An Adaptive Experimental Management project to trial ecological thinning techniques has been established in Box-Ironbark forests and woodlands of north-central Victoria with the objective of restoring a diversity of forest types, including a predominance of widely spaced older trees. Treatments with varied tree-removal rates and retained patchiness were designed to focus on habitat restoration. Pre- and post-thinning monitoring targeted a range of ecosystem components, including types of habitat and forest structure. Thinning was implemented in large-scale plots at four conservation reserves between 2004 and 2007. Pre-thinning, plots were dominated by high numbers of coppice generated trees. Less than 3% of trees sampled were considered large and only 3% were hollow-bearing, implying limited availability of habitat for a number of threatened fauna. The small amount of ground-level coarse woody debris recorded pre-thinning was related to the paucity of large trees. Ecological thinning resulted in a shift towards increased mean stem diameter and significant increases in coarse woody debris. Other habitat categories post-thinning, including fine debris and litter depth, were found to be measurably higher than pre-thinning values. Vegetation responses to ecological thinning included increased herb cover, tussock grass cover and profuse herb and shrub flowering. For vertebrate fauna, ecological thinning affected the occurrence of some diurnal birds as well as some other vertebrate groups. For bird assemblages, species richness increased following ecological thinning. Understorey species were strong contributors to this result responding favourably to the greater complexity of ground layer habitats brought about by the substantial increase in coarse woody debris. Bat activity was greater in plots following thinning. Dominant components of the ant assemblage also responded favourably to disturbance associated with thinning. The results of this trial will contribute to future management of Victoria's Box-Ironbark parks and reserves system.

Questions/Notes:

A new weed emerges from drought – controlling *Lachnagrostis filiformis* (Fairy Grass) on dry lakes

Andrew Warnock, Singarayer Florentine and Patrick Graz

Centre for Environmental Management, University of Ballarat, Mt Helen, Victoria.

Abstract

The indigenous *Lachnagrostis filiformis* (Fairy Grass) has colonised extensive areas of dry lakebeds in western Victoria during the current (1997–) drought. Large numbers of the plants' detached seed heads disperse in the wind and lodge against housing, fences, railway lines and other obstacles. This accumulation of plant material creates a fire hazard, degrades township aesthetic values and presents a nuisance to communities of lakeside towns. The effects of current measures to control blown *L. filiformis* seed heads both in the short and long-term are unclear. This study aimed to examine the effects of various control methods on *L. filiformis* infestations and associated plant species in the short and long-term and to develop a potential long-term solution. Methods trialled were late season application of Glyphosate-based herbicide, slashing, seed broadcasting of *Atriplex australasica* and *Puccinellia perlaxa*, grazing and burning. Results show that, whilst herbicide and slashing are effective in controlling blown *L. filiformis* seed heads in the short-term, they fail to prevent subsequent re-colonisation. Late application herbicide resulted in an increased foliage cover and seed head biomass of *L. filiformis* by up to 37% and 150% respectively in the year following treatment application. The effect of grazing varies, but can result in increased foliage cover of *L. filiformis*. *Lachnagrostis filiformis* plants and seeds have been noted to survive a fire event, making the long-term effectiveness of burning doubtful. The results highlight how weed management aimed at achieving short-term goals without controlling the mechanisms of invasion can be counter-productive in the long-term.

Questions/Notes:

Ecology of Red Deer (*Cervus elaphus*) in the Grampians National Park: interactions with native grazers and woodland vegetation

Cathy Roberts, Singarayer Florentine, Simon Cook and Martin Westbrooke

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Abstract

Despite increasing concern about the impact of introduced deer species on the Australian environment, little is known about the ecology of deer in Australia, or how they interact with native herbivores in influencing vegetation condition. This study explored the ecology of Red Deer. The population density of Red Deer was examined in four woodland Ecological Vegetation Classes (EVCs), and compared with that of two native herbivores - the Eastern Grey Kangaroo and Swamp Wallaby. The home range size, habitat use/selection, and ranging behaviour of Red Deer was also examined, along with diet. In addition, the role that Red Deer and other herbivores play in influencing woodland vegetation condition was examined using exclosure plots.

Questions/Notes:

Pattern, process and the conservation of the endangered Growling Grass Frog in Melbourne's urbanising landscapes

Geoffrey Heard

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Abstract

Habitat alteration resulting from urbanisation is one of the principal causes of global biodiversity decline. In Australia, the extent of urbanised land remains relatively small; however, the rapid escalation of urbanisation in most major cities is of great concern for the conservation of various threatened species and ecosystems. The Growling Grass Frog (*Litoria raniformis*; Anura: Hylidae) is a prominent example in Victoria. This endangered frog remains widespread on the urban fringe of Melbourne, yet it is highly sensitive to habitat loss and fragmentation, given its reliance on metapopulation processes for persistence. With Melbourne planned to grow by ~1 million people over the next 20 years, the required urban expansion of the city has the potential to significantly worsen the species' already imperilled state. In this paper, I describe current and future directions for research on the conservation of *L. raniformis* in Melbourne's urbanising landscapes. Current research is focussed on identifying the determinants of the frog's extinction and colonisation dynamics, as well as determinants of their probability of detection. In the short-term, this work will be used to develop guidelines for the management and monitoring of remnant populations. In the long-term, it is hoped that the resulting data will allow development of a metapopulation model for *L. raniformis*, which can be used to make quantitative predictions about the viability of specific metapopulations under differing management scenarios. Both of these initiatives will be of significant benefit to the various land managers charged with conserving this spectacular frog on Melbourne's urban-fringe.

Questions/Notes:

What is habitat? The effect of sex, diel period and spatial scale

Julian Di Stefano

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Abstract

Animals are expected to gain fitness benefits by selecting better quality habitats, so understanding the factors influencing quality is an important component of habitat management. To this end, statistical modeling techniques are often used to relate habitat selection to important resources such as food and shelter. However, patterns of resource selection are likely to be influenced by factors unrelated to resource availability, and habitat suitability models may be misleading unless such variables are taken into account. In this presentation, two associated data sets are used to show how three factors unrelated to resources (sex, diel period and spatial scale) influenced the selection of food and shelter by Swamp Wallabies (*Wallabia bicolor*). The first data set quantifies habitat selection within individual home ranges, and incorporates both sex and diel period as additional factors. The second quantifies habitat selection by female Swamp Wallabies at the scale of 2 m radius plots during both diurnal and nocturnal periods. At the home range scale, patterns of resource selection were influenced by sex and diel period. Both males and females selected sheltered habitat during the day. At night, females selected forage-rich habitat, but habitat selection by males was unrelated to either food or shelter. For females, the factors affecting diurnal habitat selection were scale-dependent, with both food and shelter influencing small-scale habitat choices. In contrast, the motivation for nocturnal selection appeared to be independent of spatial scale, as it was associated with food resources in both the home range and plot-scale analyses. For Swamp Wallabies, habitat appears to be defined by a complex set of factors. Resource availability was clearly important, but the relative influence of different resources was affected by sex, diel period and spatial scale. The complexity of the observed response is discussed in relation to the suitability of simple habitat models for managing landscapes.

Questions/Notes:

Widespread but not immune: the bush rat in a highly fragmented landscape

Greg Holland and Andrew Bennett

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Abstract

The loss and fragmentation of natural habitats is one of the most pervasive forms of environmental change occurring today. Effective biodiversity conservation will increasingly depend on the ability to preserve populations in fragments of habitat embedded in modified landscapes. Understanding the dynamics of subdivided populations is therefore of critical importance. We studied populations of the native Bush Rat, *Rattus fuscipes*, in an agricultural landscape in south-western Victoria where <10% of the original forest cover remains. The Bush Rat was widespread in the study area, occurring in 75% of the 48 forest fragments surveyed. Vegetation characteristics were the primary influence on site occupation; fragmentation effects (the size and isolation of forest fragments) were of little value in describing the distribution pattern. However, a detailed investigation of population processes in a subset of forest fragments revealed that the Bush Rat was more sensitive to fragmentation than its distribution pattern would suggest. Population performance declined with fragment size: compared to large fragments, populations in small fragments occurred at lower densities, had younger age structures, received fewer immigrants, and displayed less predictable reproductive patterns. The ability to disperse between fragments was hypothesized to be a key mechanism allowing the Bush Rat to contend with the demographic challenges posed by forest fragmentation. This was confirmed via a manipulative experiment whereby fragments of suitable quality were successfully recolonised following simulated extinctions (the removal of all resident animals). Such a capacity for movement allows the Bush Rat to remain widespread in the study area despite many local populations being vulnerable to extinction. An understanding of the impact of habitat fragmentation on population processes will be critical for the conservation of biodiversity in increasingly modified landscapes.

Questions/Notes:

Demonstrating the impacts of ground tank closure on biodiversity and landscape function in arid Australia

S. Cook , P. Gell , F. Christie, F. P. Graz, M. Westbrooke, S. Florentine and G. Thomas.

Centre for Environmental Management, University of Ballarat, P.O. Box 663, Ballarat Victoria,

Abstract

Abundant literature suggests that provision of artificial water through bores, dams and ground tanks has negative environmental effects in terms of increased grazing pressure, prevention of native species regeneration and promotion of exotic plant and animal species. Though some species may benefit from increased provision of water, watering points are a major factor in the decline of native species. In the arid zone of Australia, as in arid environments worldwide, few areas remain distant from water. Factors associated with ground tanks potentially affecting biodiversity include: extended periods of high moisture availability; increased grazing pressure from stock, rabbits, feral goats and kangaroos and increased nutrients due to high defecation rates around tanks. Past studies addressing these issues have been limited in: the range of fauna and flora investigated; lack of experimental manipulation at the landscape scale and failure to adequately replicate experimental treatments. The research being carried out at Nanya Station in semi arid Australia is investigating the impacts of four alternative water point closure treatments: 1) fencing to exclude mammalian grazers; 2) partial tank closure by blocking of inlets to reduce catchment of runoff; 3) complete tank closure through backfilling; 4) left as is to act as a control. Each of these treatments replicated three times, and monitoring sites have been established at varying distances from each tank; 0, 20, 500 and 1500 meters. A range of taxonomic groups including plants, mammals, birds, reptiles and ants are being monitored at each of these sites to assess their responses to treatment and distance effects. Preliminary results indicate changes in community structure for some taxa. This study provides a significant opportunity to obtain data that will help address the issue of biodiversity conservation and serve as a model for many other arid lands in Australia and worldwide.

Questions/Notes:

Climate and breeding in Australian birds

Heather Gibbs

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Abstract

Climate change is already influencing Australian ecosystems, but our knowledge of its effects is still very limited. More information is urgently required to understand the effects of climate change and how to manage them. This presentation highlights some important long-term avian data sets and shows how linking existing data to climate can generate new insights into important ecological processes. There are dramatic between-year differences in the amount of breeding across a range of bird species, and these relate strongly to climate, and in particular, to a large-scale climatic index, the Southern Oscillation Index (SOI). The SOI strongly influences climate across most of Australia, so while it is unsurprising that this translates into changes in birds' breeding patterns, the magnitude of the effect may be larger than previously anticipated. One of many next steps is to interpret birds' responses in terms of local temperature and rainfall, but this is a more challenging process.

Questions/Notes:

Bird Assemblages in a heathy woodland: investigating the effects of time since fire on resource availability

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Abstract

Inappropriate fire regimes are recognised as a major factor contributing to the decline of many threatened Australian mainland bird species. However, how differing fire regimes affect many bird species and communities across Australia remains largely unknown. This lack of knowledge is particularly evident for woodland birds, which are declining nationally, partly as a result of fire regimes. A short-term study was carried out to investigate the relationship between time since fire (TSF) and resource availability for bird assemblages in a heathy woodland of south-west Victoria. Habitat assessments of 20 study sites representing four TSF age classes (0-3, 4-10, 11-25, >25 years) were conducted to characterise TSF categories and to quantify resource availability for avian assemblages. No significant differences were detected in bird species richness and abundance or communities across the TSF categories. However, a small number of species were found in greater numbers or recorded only within 11-25 and >25 year TSF categories. Habitat assessments revealed significant differences in ground cover and overstorey components, and a trend of increasing habitat complexity with TSF. The research findings suggest that current fire management prescriptions applied in this area, which encompass a diversity of TSF classes, are not adversely affecting avian assemblages. However, areas of long unburnt forest should be maintained to encourage the persistence of species found predominantly within these areas. Results indicate that long-term studies encompassing seasonal information should be undertaken to assess patterns of resource availability at a landscape scale.

Questions/Notes:

The habitat preferences of an indigenous despot – the Noisy Miner

Merilyn Grey, Rick Taylor, Joanne Oldland, and Mike Clarke

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Abstract

The Noisy Miner (*Manorina melanocephala*) has long been recognized as exhibiting extraordinary levels of interspecific aggression, particularly towards small insectivorous birds. In many cases this results in the monopolisation of remnant vegetation by Noisy Miners to the detriment of other species and possibly the health of the trees in the remnant. If habitat restoration works are to avoid creating additional habitat for Noisy Miners, a deeper understanding is needed of the manner in which Noisy Miners select and use the habitats they occupy. Our research has identified the broad-scale features of remnants that enhance the likelihood that they will be occupied by Noisy Miners. These include peninsulas of remnant vegetation that protrude into paddocks and that are located on comparatively deep and fertile soils. In this study we examined the fine-scale use of habitat by Noisy Miners foraging on the ground. When ground foraging, Noisy Miners showed a significant preference for grazed sites. Such sites typically had shorter grass and less dense grass cover, were closer to fallen trees and the presence of a tree canopy than sites not used for ground-foraging. The Noisy Miner's avoidance of sites with long, dense grass may represent an opportunity to a manage remnants in such a way as to make them less attractive to Noisy Miners, and therefore more accessible to other species of birds.

Questions/Notes:

Panel Discussion
Building Resilience into our Ecosystem

Chair: *Prof. Peter Gell*

Outline and instruction to conference participants and panel members:

We are planning to run a panel session at the end of the conference. Members of the audience will have been listening fairly passively for nearly the whole day by the time this session commences. Therefore, we are keen to create opportunities for them to participate in the discussion.

We are going to provide a box onto which participants can submit questions that the panel can address. We will remind you at various stages of the conference to submit your questions. Prof. Peter Gell will sort these out during the tea break – we suggest that you provide your name so that Prof. Gell can request some clarification if needed. The chair will then ask a suitable panellist to respond to that question. Other panel members will, of course, be free to provide additional input if they are so inclined.

Members: Prof. Roger Jones, Prof. Max Finlayson, Prof. John Sherwood, Assoc. Prof. Ian Lunt, Andrew Barton (GWM Water), and Carrie Deutsch (Victorian National Parks Association)

Some potential questions:

- How will species respond to climate shifts and how can we accommodate their needs and responses across fragmented landscapes?
- How do we go about prioritising sites worthy of allocation of scarce water supplies?
- How can we optimise the use of water for multiple benefits?
- Threatened species in a changing environment - do we give up?
- How should we manage biodiversity conservation issues on private land?
- Managing conservation reserves – what are new challenges
- What new directions are needed in environmental policy?
- What should be the priorities for environmental education/training in Universities?